Novel Methods to Identify Momentary Risk States for Stress & Physical Inactivity

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Novel Methods to Identify Momentary Risk States for Stress & Physical Inactivity Behavioral risk factors, such as physical inactivity, poor stress management, poor diet, and smoking, are responsible for about 80% of coronary heart disease and cerebrovascular disease (WHO, 2011), and they are partly responsible for other negative health outcomes, such as high lipids, high blood pressure, cancer, diabetes, and obesity. Thus, helping individuals to change unhealthy behaviors and maintain healthy ones can decrease morbidity and mortality from cardiovascular disease, diabetes, and cancer. It can also help individuals manage symptoms of osteoarthritis, menopause, and other physical issues that impact health and quality of life. This BD2K K01 proposal is for the purpose of establishing myself as an independent researcher in the development and application of big data methods for health-behavior change and maintenance. I aspire to improve public health by developing, extending, and applying big data methods in biobehavioral health research to help individuals develop and maintain positive health behaviors, specifically those related to physical activity, diet, and stress management. To achieve this goal, my training plan focuses on developing expertise in (a) statistical methods for the analysis of large, complex, high-dimensional data; (b) computer science and informatics, along with advanced high-performance computing topics for accessing, managing, and processing big data; and (c) the theories and measurement of health behavior change, specifically with regards to intensive assessment of physical activity and stress management. My training and research activities will take place under the mentorship of Drs. Runze Li (primary mentor), Vasant Honavar (co-mentor), and Joshua Smyth (co-mentor). In order to examine individuals' engagement in physical activity, stress management, and other health behaviors, I will use this funding to develop and apply big data methods that can integrate data across multiple time scales and studies, better infer causality, and account for dependencies (e.g., time-structure, dyads) in the data. I will publish manuscripts on these methods in both technical and health-behavior journals, and I will disseminate software to clinical researchers so that they can use these methods in their work. At the completion of this grant, I will be prepared to make important contributions as the data scientist on interdisciplinar teams that develop health behavior interventions. This work will have broad implications for public health, in particular for the development of adaptive, individualized, health-behavior interventions delivered in real-time, real-world contexts. PUBLIC HEALTH RELEVANCE: Healthy behaviors such as physical activity can decrease the risk of cardiovascular disease, diabetes, and other adverse health outcomes. Increasingly, researchers collect vast amounts of data related to these behaviors and outcomes, but new statistical methods are needed to take advantage of the spectacular opportunities these data present. The proposed research will develop and apply big data methods to promote health behavior change; these methods will have broad implications for public health, particularly for the development of adaptive, individualized, health-behavior interventions that will deliver a specific intervention at the specific moment when it is needed, thereby increasing efficiency and effectiveness of interventions while decreasing participant burden.